

A blue sky with a large white cloud. The cloud is on the left side of the image and extends towards the center. The text is overlaid on the cloud and sky.

*Every Breath You Take...*

Provincial Health Officer's  
Annual Report 2003

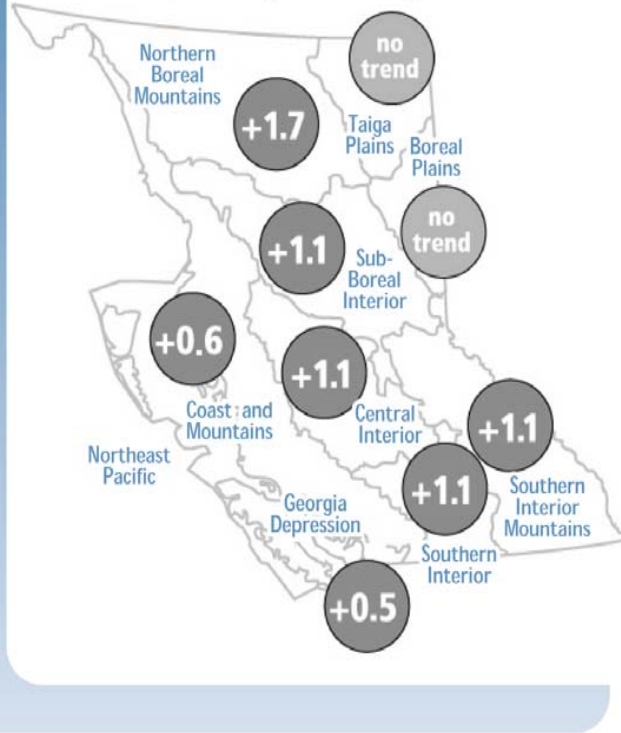
# *Report Overview*

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- The Air We Breathe
- Outdoor Air Pollutants & Their Health Effects
- Indoor Air Pollutants & Their Health Effects
- Air Pollutants & Their Health Effects in BC
- Estimates of Impact of Air Pollution On Health in BC
- Roles and Responsibilities in Managing Air Quality
- Choice of Intervention & Evidence of Effectiveness
- Recommendations

**FIGURE 1.1**

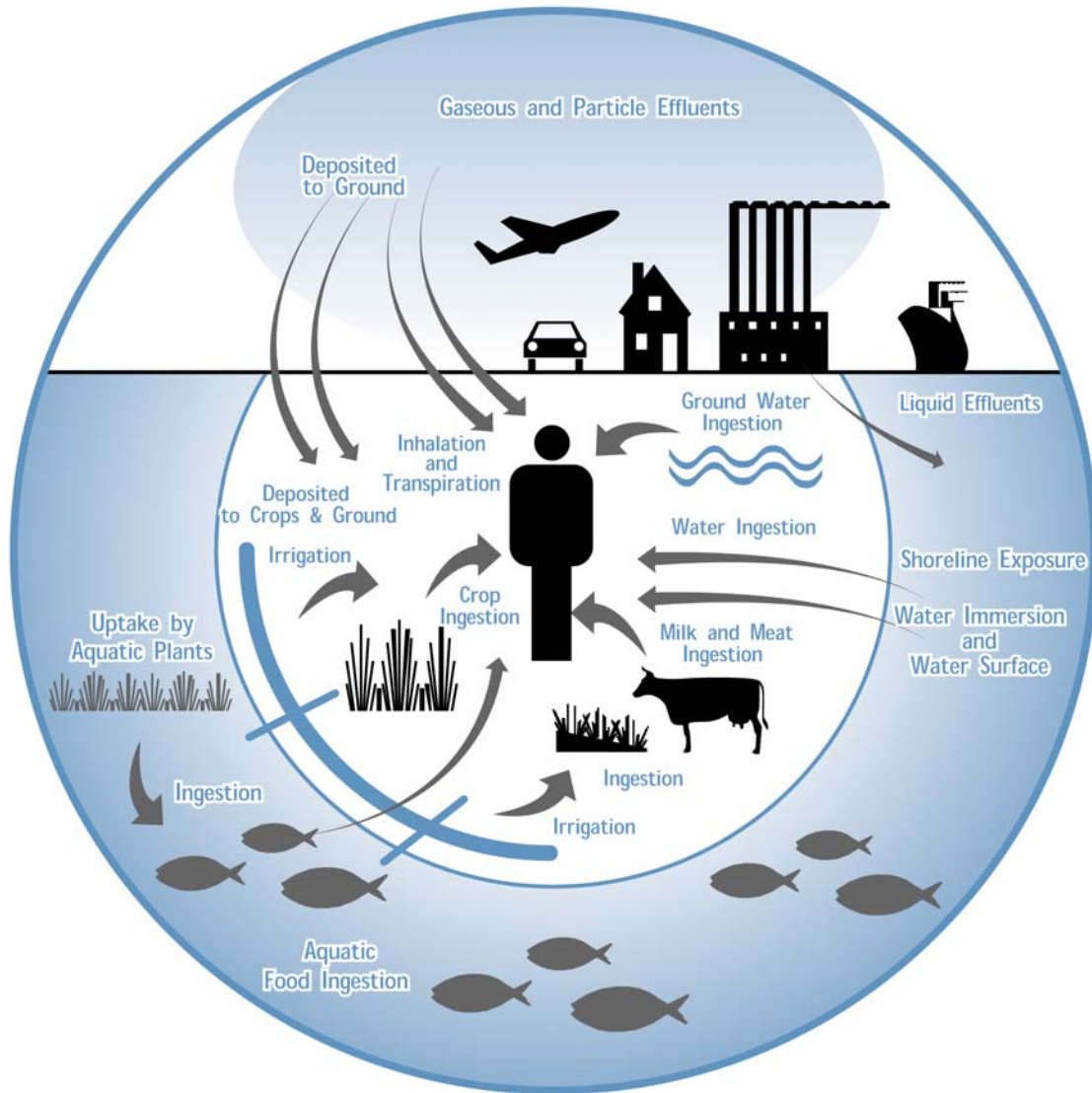
**Average Air Temperature Change from 1895-1995, in Degree Centigrade**



Source: B.C. Ministry of Water, Land and Air Protection.  
Data from Environment Canada. Analysis by Canadian  
Institute for Climate Studies, 2001.  
<http://wlapwww.gov.bc.ca/soerpt/pdf/ET2002Oct221.pdf>

FIGURE 1.4

Multiple Environmental Pathways of Toxicant Exposure



## *Air Quality in BC*

- By Canadian and world standards, British Columbians enjoy good air quality
- Interior, North and Lower Fraser Valley experience higher exposure to pollutants than other areas of the province



# *Major Anthropogenic Sources of Outdoor Air Pollutants in BC*

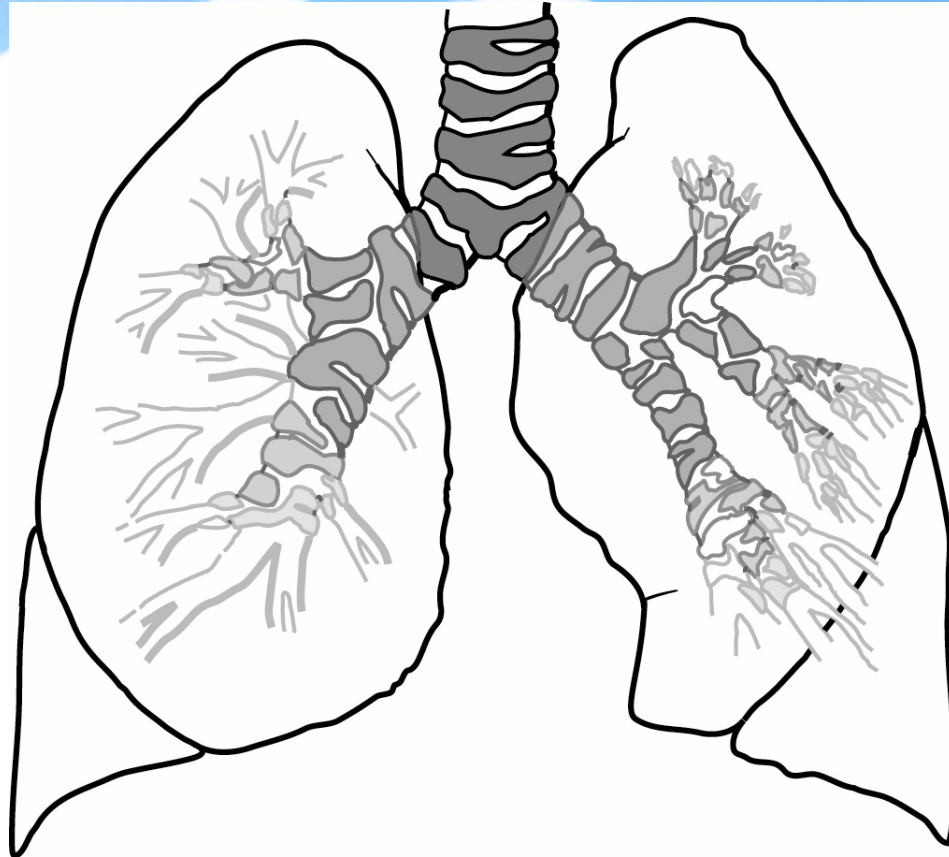
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- Burning of fossil fuels such as gas, oil, coal and wood
- Emissions from cars, trucks and other motor vehicles and machinery
- Emissions from industrial manufacturing and processing plants
- Burning of agricultural and forestry materials

# Major Outdoor Air Pollutants

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- Particulate matter (PM)
  - $PM_{10}$
  - $PM_{2.5}$
- Ozone
- Sulphur Dioxide
- Nitrogen Dioxide
- Carbon Monoxide



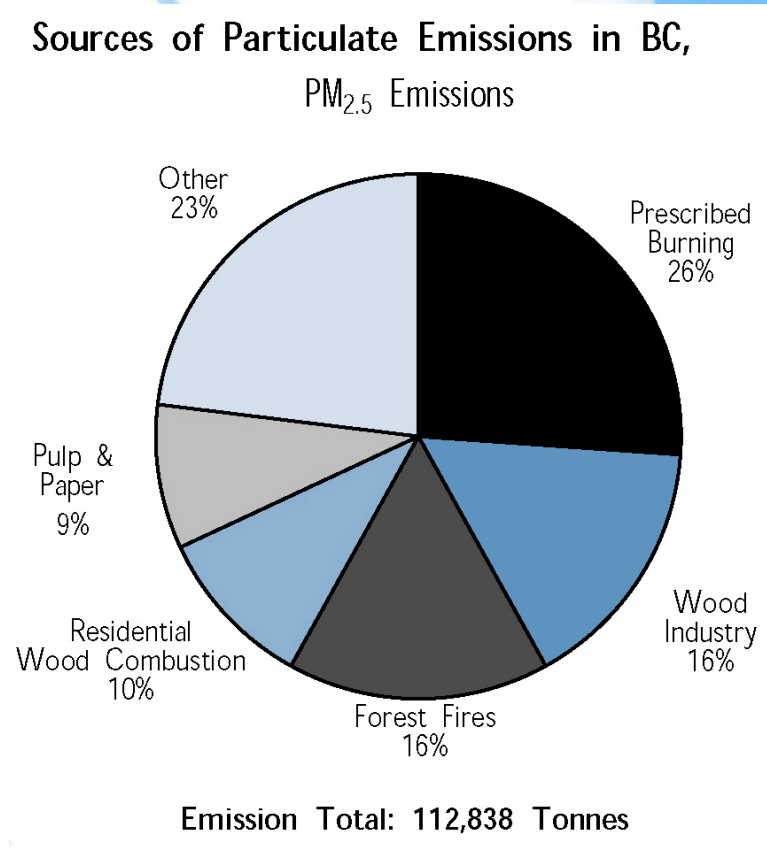


# Health effects of Major Outdoor Air Pollutants

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- **PM<sub>2.5</sub>** – respiratory diseases such as asthma, bronchitis, emphysema and cardiovascular diseases
- **Ozone** – asthma, bronchitis, coughing and chest pain
- **Sulphur Dioxide** – respiratory diseases such as asthma, bronchitis and emphysema
- **Nitrogen Dioxide** – pulmonary & respiratory irritation
- **Carbon Monoxide** – reduces oxygen delivered to muscles including the heart

# PM<sub>2.5</sub> Emissions in BC, 2000

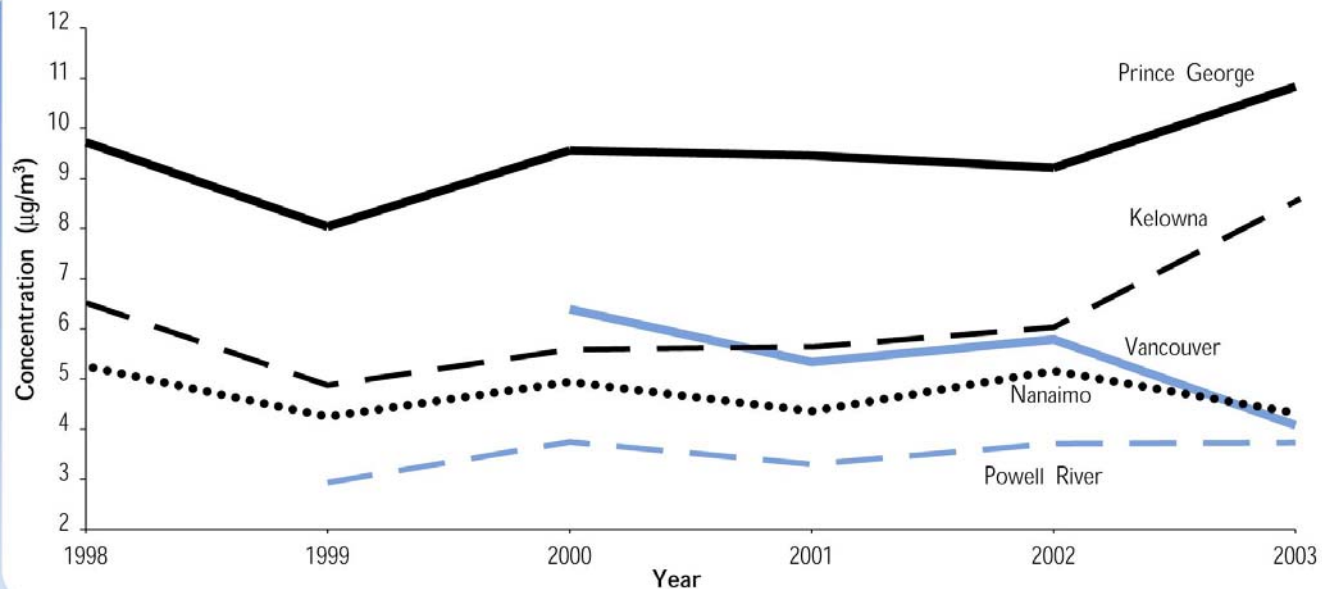


Source: Environment Canada, 2004

# Annual Concentrations of PM<sub>2.5</sub> for 5 Cities Over Time, 1998-2003

FIGURE 4.3

Annual Concentrations of PM<sub>2.5</sub> for 5 Cities Over Time, BC, 1998 - 2003



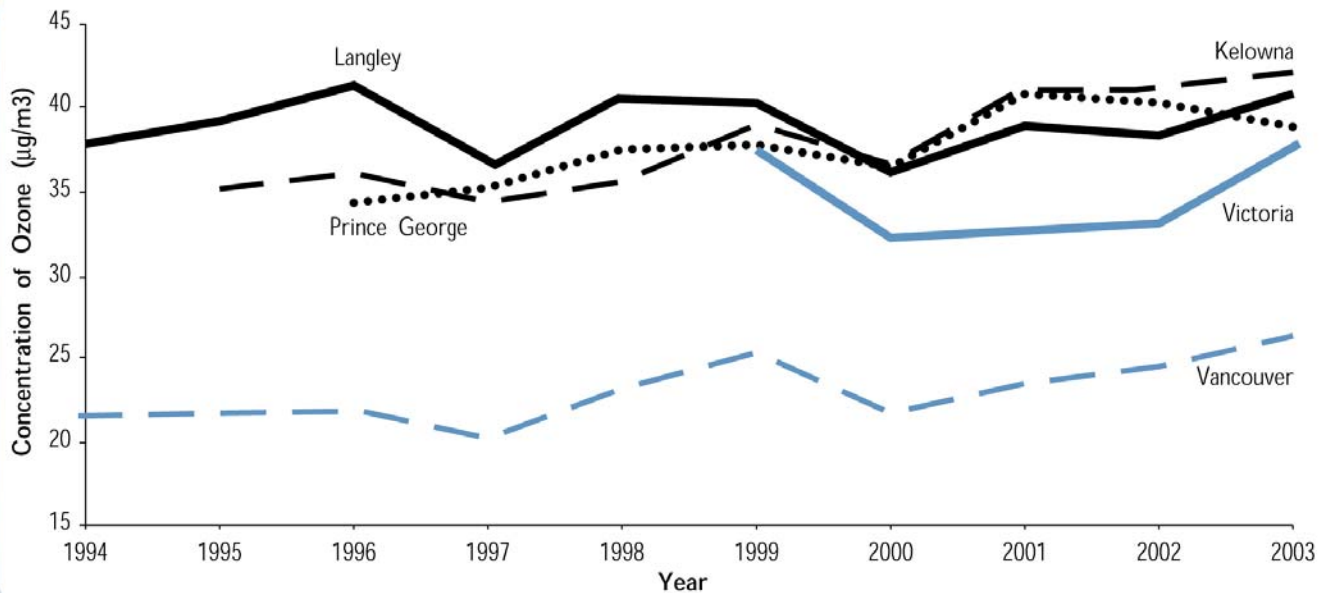
Note: The line plots show trends in mean concentrations at specific monitoring sites across a number of years.

Source: BC Ministry of Water, Land & Air Protection, 2003.

# Annual Concentrations of Ozone for 5 Cities Over Time, 1998-2003

FIGURE 4.7

Annual Concentrations of Ozone for 5 Cities Over Time, BC, 1994 - 2003



Source: BC Ministry of Water, Land & Air Protection, 2003.

# Major Indoor Air Pollutants

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- Second-hand smoke (also known as environmental tobacco smoke)
- Mold
- Volatile Organic Compounds (VOCs)
- Radon

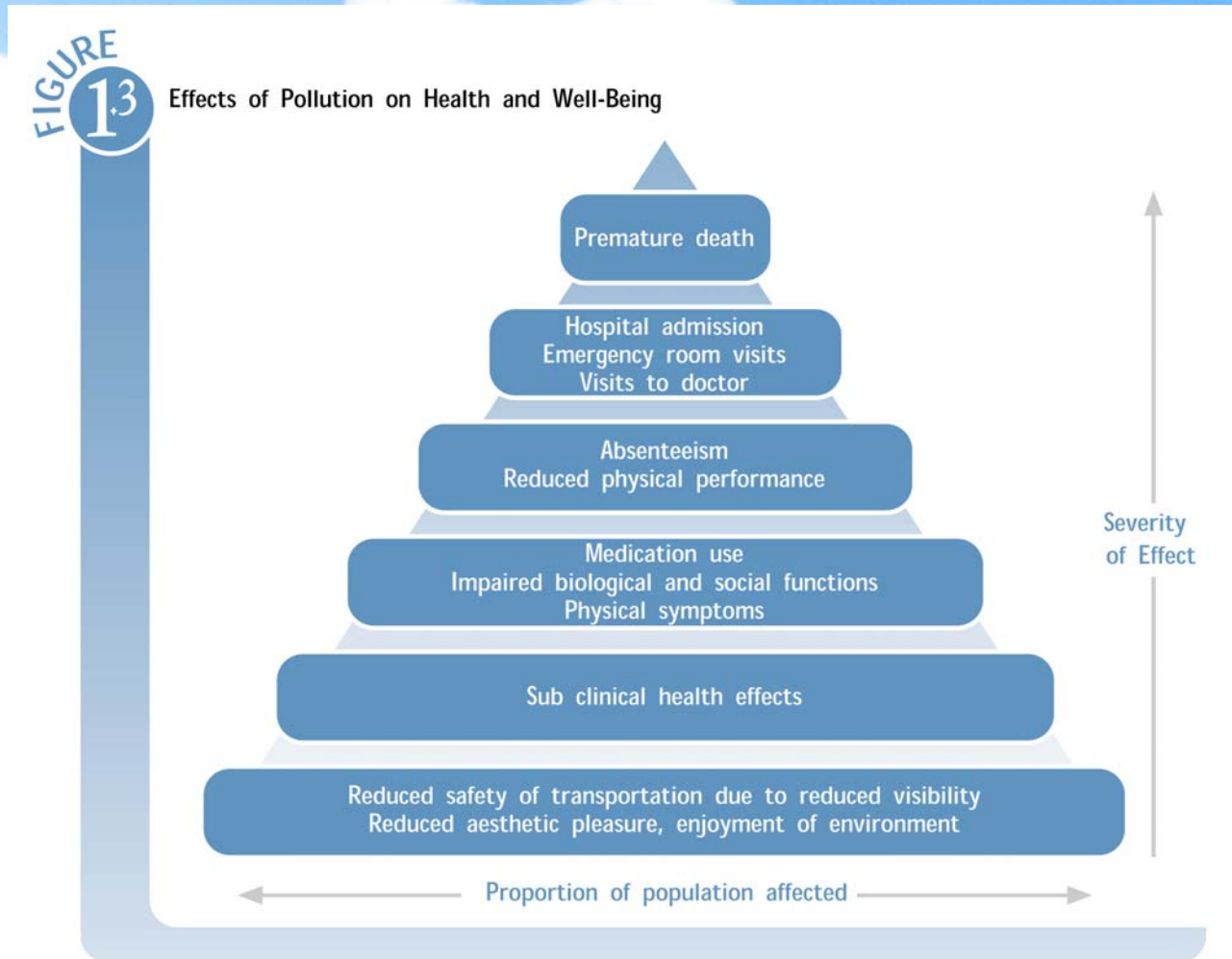


# Health Effects of Major Indoor Air Pollutants

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- **Second-hand smoke** – lung cancer, heart disease, pre-term births, spontaneous abortions, asthma, respiratory infections, leukemia, breast cancer and cervical cancer
- **Mold** – pulmonary irritations
- **VOCs** – eye irritation, lung damage
- **Radon** – lung cancer

# Effects of Pollution on Health and Well-Being

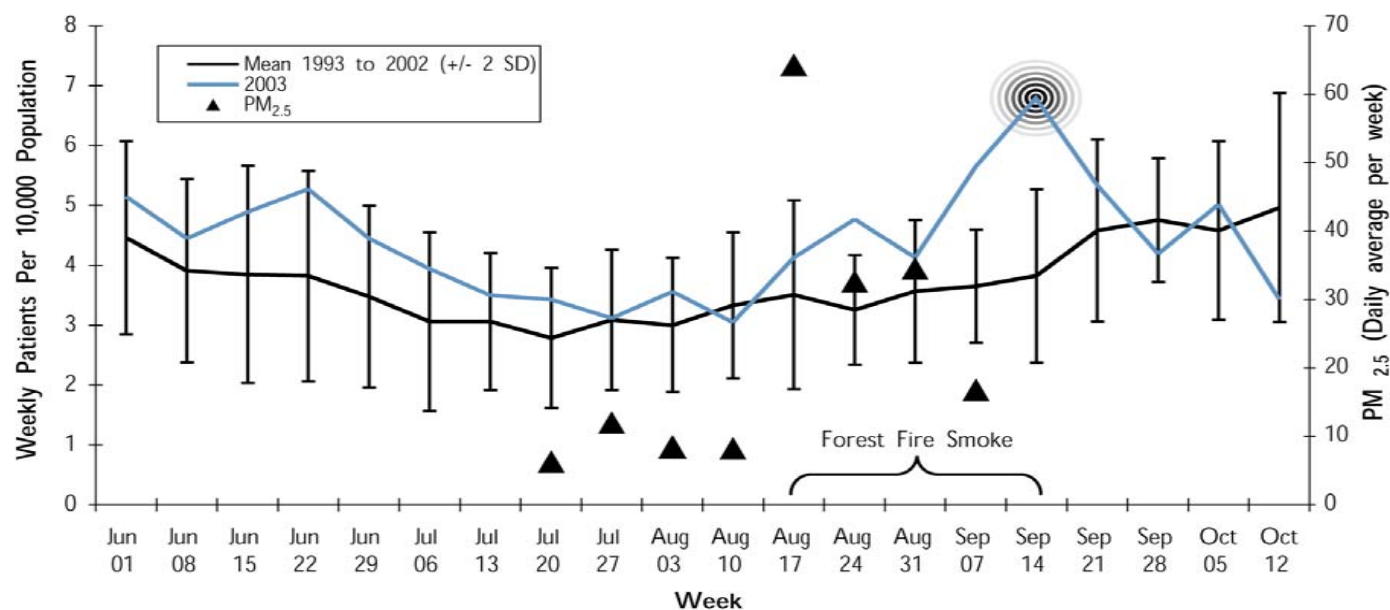


Source. Adapted from Health Effects from Air Pollution (Pyramid of Health Effects), by Health Canada, n.d., Ontario: Health Canada.

# Case study – Forest Fires, BC, 2003

FIGURE 4.15

Respiratory Disease, MSP Patients, LHA 23 - Central Okanagan, BC, Weeks of June 1 to October 12, 1993-2003



- Notes:
1. Specialties included are General Practice, Pediatrics, Internal Medicine, Public Health, Geriatric Medicine and Emergency Medicine Services for ICD9: 460-519 billed through the Medical Services Plan (MSP). Service codes included are regional and complete exams, consultations, and home and emergency visits. These data represent the number of individual patients per week, provided by FFS or PCDP practitioners. Pathology services by general practitioners were excluded.
  2. The accuracy of the diagnostic coding data, as entered on billing claims submitted to MSP, is unknown, but is believed to be adequate for the purposes of retrospective general community surveillance.
  3. Inter-area and intra-area variations must be interpreted with caution, as data relating to physician services utilization may be influenced by many factors, including severity of symptoms, physician access, and diagnostic coding practices. MSP data are current as of November 4, 2003, but the last few weeks may be incomplete due to the lag time in bill processing activities.

Source: Population Health Surveillance & Epidemiology, Ministry of Health Services, 2003.

# Studies on Health Impacts of Air Pollution in BC

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- No comprehensive study in BC
- Extrapolation of selected BC studies, Ontario studies and International data

# Improving life expectancy by reducing PM<sub>2.5</sub> levels in BC, 2004 (Annual Estimates)

<b>Communities</b>	<b>Deaths delayed by reduction of PM<sub>2.5</sub> to 6 µg/m<sup>3</sup></b>	<b>Deaths delayed by reduction of PM<sub>2.5</sub> by 1 µg/m<sup>3</sup></b>
<b>Coastal</b>	-	<b>26</b>
<b>Fraser Valley</b>	-	<b>7</b>
<b>GVRD</b>	-	<b>49</b>
<b>Interior</b>	<b>71</b>	<b>28</b>
<b>Total</b>	<b>71</b>	<b>110</b>

*Note:* Analysis based on report entitled *Health and Air Quality 2002-Phase 1, Methods for Estimating and Applying Relationships between Air Pollution and Health Effects* (Bates et al., 2003) and based on provincial PM<sub>2.5</sub> data from Ministry of Water, Land and Air Protection.



# Estimates of Annual Mortality Burden of Air Pollution in BC (excludes radon)

	Low Estimate (1)	Low Intermediate Estimate(2)	High Intermediate Estimate (3)	High Estimate (4)	Health Canada Estimate for Second-hand Smoke (5)	Estimates of Delayed Mortality for PM <sub>2.5</sub> (6)
Outdoor air pollution	82	25-250	115-402	644	NA	71-110 (6)
Indoor air pollution	21	5-45	25-89	141	NA	NA
Second-hand smoke	108 (5)	108 (5)	108 (5)	108 (5)	108	NA
Total	224	138-403	248-599	893	108	71-110

# Estimated Hospital Admissions and Emergency Room Visits due to Air Pollution in BC (excludes Radon)

	Mid-Point Estimate Outdoor Air Pollution	Mid-Point Estimate Indoor Air Pollution	Estimate Second- hand smoke	Mid-Point Estimate TOTAL	Range
Hospital admissions	712	129	557	1398	712-2079
Emergency room visits	944	171	739	1854	943-2757

# Healthcare costs of Air pollution in BC

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- So far, no formal costing exercise in BC.
- Extrapolated estimate places the health burden of air pollution at about \$167 million every year.
  - \$85 million for outdoor air pollution
  - \$15 million for indoor air pollution
  - \$67 million for second-hand smoke

**Table 5.6: Comparison of the Low-Intermediate Estimate Range for the Burden of Air Pollution and Other Causes of Mortality in British Columbia (*excludes Radon*)**

<i>Outdoor Air Pollution</i>	25 - 250
<i>Indoor Air Pollution</i>	5 - 45
<i>ETS Estimate (1998)</i>	108
<i>Total Air Pollution</i>	138 - 403
<i>Homicide</i>	37
<i>Cervical Cancer</i>	43
<i>AIDS</i>	104
<i>Motor Vehicle Accidents</i>	399
<i>Lung Cancer</i>	2015
<i>Female Breast Cancer</i>	600
<i>Cardiovascular Diseases (ICD I00-I51)</i>	6893
<i>Work-Related Deaths*</i>	149

\*Note: Work-related deaths reported by the Workers' Compensation Board (2003).

# Roles & Responsibilities of Managing Air Quality

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- Federal government
  - International negotiation
  - Cooperation with provincial and territorial governments
  - Multilateral agreements such as Kyoto Protocol and World Commission on the Environment and Development
  - New Vehicle and Fuel Standards
  - Initiatives to reduce VOC emissions



# Roles and Responsibilities of Managing Air Quality

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- Provincial Role
  - Authority to regulate air pollution sources
  - Setting environmental quality benchmarks, targets and standards
  - Developing strategies to reduce pollution
  - Fostering partnerships with stakeholders
  - Monitoring and reporting on the environment
  - Inspecting and auditing
  - Enforcing provincial legislation

# Roles and Responsibilities of Managing Air Quality

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- BC government
  - Environmental Management Act
  - Airshed plans in GVRD, FVRD, City of Prince George, Resort Community of Whistler, City of Quesnel and Bulkley Valley-Lakes District
  - Tax incentives for use of alternative fuels and fuel vehicles
  - AirCare

# Roles and Responsibility of Managing Air Quality

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- Municipal government
  - By-laws
    - Backyard burning, zoning, transportation, land-use planning, regional growth strategies and sustainability planning
  - Zoning, transportation and land-use planning
  - Regional growth strategies and sustainability plans
  - Initiatives such as replacing old woodstoves in Vernon

# Priority Actions

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- Reduce exposure to second-hand smoke across BC
  - Victoria - the first city in Canada to introduce a total ban on smoking in all public indoor places in 1999.
  - BC led the way with workers' protection legislation but should now proceed with introducing a total ban on smoking in all public places.
- Reduce particulate emissions in Interior and rural BC

# Priority Actions

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- Improve Aboriginal people's living conditions by reducing indoor pollutants such as second-hand smoke, molds and others
- Reduction of Transport emission in Lower Mainland by:
  - Providing rapid public transit
  - Community planning to make walking, biking safe and viable
  - Tax policies & incentives
  - Diesel/Alternative cleaner technologies
  - Reduce Marine Emissions



# Priority Actions

- Providing public education programs on what individuals can do to improve air quality for themselves and for future generations.
  - Personal decisions.
  - Supporting regulations.
  - Taking part in airshed planning.

# What can individuals do about air pollution?

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- Stop smoking
- Replace non-certified wood-burning stoves
- Choose alternative transportation (e.g., walking, public transit, bicycles)
- Choose a vehicle with fuel efficiency
- Address moisture issues at home
- Address Radon where applicable

# What can corporations do about air pollution?

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- Invest in new sources of renewable energy
- Partner with government to improve standards and promote self-regulation
- Encourage company health programs (e.g., stop smoking)
- Promote quality indoor air in workspaces with independent assessments
- Engage in research and development of products that would support sustainable technology

# What can universities and colleges do?

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- Engage in research activities to better define and describe air pollutants and estimate burden of disease.
- Study inequities and vulnerabilities in community exposure.
- Use their reputation and teaching capacity to participate in educating the public on air pollution.
- Devise approaches to study the costs and benefits of air quality improvement in BC.

# What can governments do?

- Continue to reduce air pollution from industrial sources
- Continue to invest in public transportation
- Create national consensus on more stringent vehicle emission standards for Canada
- Create additional tax incentives to promote efficient energy use
- Support multi-sectoral airshed planning
- Incorporate site criteria in environmental assessment



# Sumas 2 vs. Human Sources Emissions in Fraser Valley

*Projected yearly emissions by Sumas 2 and Vehicle emissions in tonnes,\*\*\* Lower Fraser Valley, 2000*

<b>Source</b>	<b>VOC</b>	<b>SO<sub>x</sub></b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>
<i>Sumas 2</i>	138	62	131	189
<i>Light-Duty Mobile*</i>	25,770	775	22,712	431
<i>Municipal Lower Mainland**</i>	70,911	8,706	82,501	10,064

*\* Generated using data for light duty vehicles operated by gasoline and diesel.*

*\*\* Includes all municipality/electoral areas, and marine areas.*

*\*\*\* Tonnage, though not specific to a particular time or place, is useful on a broad comparison level.*